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Numerical study of the respiCon sampler performance in the calm air

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Abstract

Results of a numerical study of the RespiCon sampler performance in the calm air are presented. The air flow is described by the Navier-Stokes equations of axisymmetric stationary viscous flow of incompressible fluid that are numerically integrated by the computational fluid dynamics (CFD) software FLUENT. The collection efficiencies of RespiCon impactor stages agree quite well with experimental data and curves of the European standards for the thoracic and respirable dust fractions. The aspiration efficiencies derived from the numerical model overestimate the experimental data in the range of particle sizes of 10 μm < dp < 40 μm; however, they correctly predict the value of maximal size of aspirated particles. A new design of the RespiCon sampler with a higher volume flow rate was developed.

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